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Electrical Power Systems Quality

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Publisher: McGraw-Hill Professional

* Number Of Pages: 528

* Publication Date: 2002-11-26

* ISBN / ASIN: 007138622X

by Roger Dugan

This Second Edition has been expanded and updated to reflect the increasing sensitivity of microelectronic devices and the ever-growing stress placed upon

the power grid.

This much-needed resource discusses every essential aspect of basic power quality and methods used to protect electronic systems and on understanding the causes of power quality problems and learning how to prevent them.

Coverage includes:

How to protect against voltage sags and interruptions The principles of harmonics and filtering *Common wiring and grounding problems, along with solutions* Transient overvoltages due to lightning and switching *The technical impact of problems on various load equipment* Utility and end-user

strategies for improved power qualities
*Maintaining power quality in
distributed generation systems*
Benchmarking power quality

* Power quality in electric wiring

* And much more!

Electrical Power Systems Quality is an invaluable tool to everyone working in the field, from utility engineers to industrial plant technicians to power quality consultants

1. Introduction

2. Terms and Definitions

3. Voltage Sags and Interruptions

4. Transient Overvoltages

5. Fundamentals of Harmonics

6. Applied Harmonics

7. Long-Duration Voltage Variations

8. Power Quality Benchmarking

9. Distributed Generation and Power
Quality 10. Wiring and Grounding

11. Power Quality Monitoring

- * What is Power Quality?

- * Power Quality — Voltage Quality *

Why Are We Concerned About Power Quality?

- * The Power Quality Evaluation Procedure *

Who Should Use This Book

- * Overview of the *****s

Need for a Consistent Vocabulary

General Classes of Power Quality Problems *

Transients

- * Long-Duration Voltage Variations

Short-Duration Voltage Variations

Voltage Imbalance

- * Waveform Distortion

- * Voltage Fluctuation

- * Power Frequency Variations

- * Power Quality Terms

- * Ambiguous Terms

- * CBEMA and ITI Curves

Sources of Sags and Interruptions

Estimating Voltage Sag Performance

Fundamental Principles of Protection

Solutions at the End-User Level
*Evaluating the Economics of Different
Ride-Through Alternatives* Motor-
Starting Sags

Utility System Fault-Clearing Issues
Sources of Transient Overvoltages
Principles of Overvoltage Protection
Devices for Overvoltage Protection
Utility Capacitor-Switching Transients
Utility System Lightning Protection *
Managing Ferroresonance

* Switching Transient Problems with
Loads *Computer Tools for Transients
Analysis* Harmonic Distortion

Voltage versus Current Distortion
Harmonics versus Transients *

Harmonic Indexes

- * Harmonic Sources from Commercial Loads *Harmonic Sources from Industrial Loads* Locating Harmonic Sources

- System Response Characteristics*
- Effects of Harmonic Distortion *
- Interharmonics

- * Harmonic Distortion Evaluations
- Principles for Controlling Harmonics*
- Where to Control Harmonics

- * Harmonic Studies

- * Devices for Controlling Harmonic Distortion *Harmonic Filter Design: A*

Case Study Case Studies

- * Standards of Harmonics

- * Principles of Regulating the Voltage
Devices for Voltage Regulation Utility
Voltage Regulator Application
Capacitors for Voltage Regulation End-
User Capacitor Application *Regulating*
Utility Voltage with Distributed
Resources Flicker

- * Benchmarking Process

- * RMS Voltage Variation Indices *
- Harmonics Indices

- * Power Quality Contracts

- * Power Quality Insurance

- * Power Quality State Estimation
*Including Power Quality in
Distribution Planning* Resurgence of
DG

- * DG Technologies

- * Interface to the Utility System *
- Power Quality Issues

- * Operating Conflicts

- DG on Distribution Networks* Siting
DGDistributed Generation *
- Interconnection Standards

- * Resources

* Definitions

* Reasons for Grounding

Typical Wiring and Grounding Problems Solutions to Wiring and Grounding Problems * Monitoring Considerations

* Historical Perspective of Power Quality Measuring Instruments *Power Quality Measurement Equipment* Assessment of Power Quality Measurement Data *Application of Intelligent Systems* Power Quality Monitoring Standards —————

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